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Possible Effects of EMU on German Long-Term Interest Rates

It is often argued that long-term German bonds suffer from an inflation premium caused by EMU. A decomposition of long rates shows that factors besides inflationary expectations and conversion risk affect the long bond yield. The following paper therefore discusses a more complete set of channels through which currency union affects interest rates and argues that they do not all point in the direction of rising rates. Data generating processes for long-term bonds are specified and tested for structural breaks. Absence of a structural break is interpreted as evidence against a premium caused by EMU.

The prospect of European Monetary Union (EMU) at the turn of the century already affects today's long bonds, since some of which will mature at a time when the new monetary policy regime is expected to be in place. Consequently prices on long bonds, at least in part, reflect an assessment of the effects of EMU on monetary policy. German bond yields in particular, it is argued, may suffer from a premium reflecting doubts about the ability of the European Central Bank (ECB) to deliver stable prices.[1]

This paper addresses theoretically the question of EMU effects incorporated in interest rates in the context of the expectations theory of the term structure. We show that a number of components, not only expected inflation, drive the long rate. A discussion of those components shows that the effect of EMU on long-term interest rates is ambiguous. While some channels support higher interest rates, others point in the direction of lower rates. Problems that arise in empirically assessing these theoretical channels are then briefly discussed. It is argued that it is not, at least at present, feasible to disentangle empirically the various expected real and nominal effects. Consequently a more modest estimation strategy is turned to, in which a number of data generating processes are specified and tested for structural breaks. For German bonds, we find very little evidence for a structural break.

The Expectations Theory of the Term Structure

The idea of a premium on German bonds is usually supported by a number of empirical observations. First, the yield spread in Germany is near to a historic high (Figure 1). Second, in 1995 long-term US interest rates fell below German levels despite the fact that rates at the short end were lower in Germany than in the USA. Third, there is some anecdotal evidence that German savers avoid domestic bonds in favour of investments abroad.

On the other hand, 10-year bonds are near to a historic low in Germany (also Figure 1). This makes it hard to argue that long-term interest rates are too high. Second, a steep yield curve is not inconsistent with the current state of the economy.[2] Third, lack of demand at the domestic retail level may easily be offset by other investor groups. Finally, comparisons with the United States are complicated by the fact that the two countries are at different stages of the business cycle. Thus simply considering interest rate

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[1] B. Riley: Tales of the Unexpected in Global Bonds, in: Financial Times, 13 September 1995; and A. Kaletsky: German Savers Have Lost Faith in 'Camembert' Mark, in: The Times, 22 February 1996.

[2] The relationship between yield spreads and real economic activity is discussed in: M. Moersch: Interest Rates or Spreads as Predictors of Real Economic Activity, in: Konjunkturpolitik, Vol. 42 (1996), pp. 40-52.

levels and spreads to assess the existence of a risk premium is not satisfactory. A more complete treatment is instead possible in the context of the expectations theory of the term structure. This framework allows the development of the various channels that can affect long-term rates in reaction to EMU.

The long rate, according to the expectations theory of the term structure, is the average of expected short rates over the horizon of the long bond plus a term premium. The term premium is time varying and among other things rewards holders of long bonds for the exposure to greater market volatility.

Using a linear approximation, L_t^n, the n-period long-term bond is an average of current and expected one period short-term rates, S_t. $S^*_{t,t+k}$ denotes rational expectations about the short-term rate at time t+k, formed at time t. P_t is a term premium.

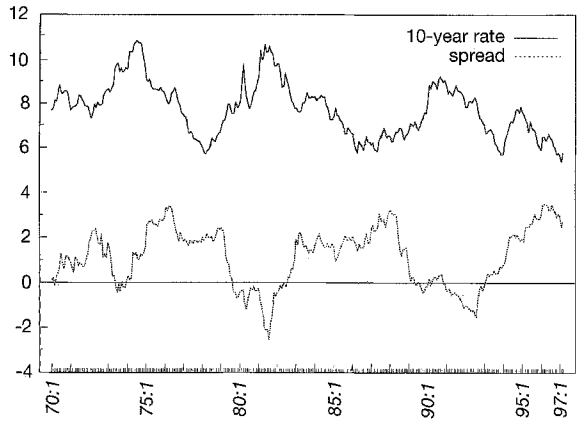
$$L_t^n = \frac{1}{n}\left[\sum_{k=o}^{n-1} S^*_{t,t+k}\right] + P_t \qquad (1)$$

This standard expression for the long bond changes when currency union occurs at time c, before the bond matures.

$$L_t^n = \frac{1}{n}\left[\sum_{k=0}^{n-c-1} S^{*,DM}_{t,t+k}\right] + \frac{1}{n}\left[\sum_{k=c}^{n-1} S^{*,Euro}_{t,t+k}\right] + P_t + C_t \qquad (2)$$

This expression captures the fact that the process for the short rate changes after currency union. The superscripts DM and Euro reflect the fact that some short-term rates will be generated under the old DM regime, while some will already incorporate the new policy regime of the ECB. We also introduce a separate term premium C_t, capturing the risks specific to currency union.

Figure 1
10-year Rate and Spread between the 10-year and 1-year Rates



Finally, the nominal rate can be decomposed into a real rate plus inflation

$$S_t = R_t + \Pi_t \qquad (3)$$

to yield

$$L_t^n = \frac{1}{n}\left[\sum_{k=0}^{n-c-1}\left(R^{*,DM}_{t,t+k} + \Pi^{*,DM}_{t,t+k}\right)\right] + \frac{1}{n}\left[\sum_{k=c}^{n-1}\left(R^{*,Euro}_{t,t+k} + \Pi^{*,Euro}_{t,t+k}\right)\right] + P_t + C_t \qquad (4)$$

Equation (4) allows a number of observations about possible EMU effects:

☐ There are a number of different channels that can affect the long-term interest rate, namely the expected real short-term rate, expected inflation, and premiums. These factors, and some of the forces driving their development will be discussed below.

☐ Once EMU commences at time c, the time series behaviour of the short-term rate will be influenced by a different monetary policy regime and thus will possibly change. However, there still exist bonds that are unaffected by this effect. The distinction between bonds that mature before and after EMU will be employed empirically later in the paper.

In the following we aim to provide a comprehensive overview of the possible effects on long-term interests rates under EMU. They should, of course, already be visible in the long-term bond yields that come due after 1. January 1999, when EMU is likely to be operating.

Influences on Real Interest Rates

Three channels of influence of exchange rate variability on real output can be distinguished. It can either affect trade because of transaction costs, it can have an influence on profits from trade, and it can thus finally have an influence on the level of production.

The most obvious reason for expecting significant economic gains from a common currency is the abolition of all exchange related transaction costs. As those costs make transborder transactions more expensive than domestic trade, they can be viewed

like a tax on international trade in goods and assets.[3] These direct effects have been estimated by the European Commission to be around one-fourth to one-half of one per cent of the GDP of the Union. Gros and Thygesen have argued that the effects of the savings of transaction costs are of the same order of magnitude as the abolition of border controls under the common market programme and thus as large as those calculated by the Checchini Report. Hence the overall GDP in the Union could rise by as much as 4.5-6.5 percent.[4] As monetary union expands trade, the standard gains from trade also increase.

Moreover, dynamic effects can be expected from a common currency. The increase in overall efficiency resulting from the common currency and the increase in trade translates into an increase of the marginal productivity of capital. This should lead to higher investment and to a higher capital stock, which in turn leads to more output with the same labour force. The multiplier estimated pertaining to the output effect from induced capital formation is 2.[5]

The expectation of important microeconomic benefits from a reduction in exchange rate variability is moreover based on the idea that exchange rate variability makes trade more risky. Apart from pure transaction costs that arise from currency diversity, the variability of exchange rates can directly influence the profits of a trading firm.[6] If a firm is, because of strong competition in the export market, forced to fix its foreign prices rather than being able to adjust them according to exchange rate changes so that profits in domestic currency remain stable, every exchange rate change translates into a firm's profits.[7] A risk-averse firm will trade less than it would do in the absence of profit risk.

Finally, the Commission's study on the common currency predicts that reduced uncertainty from a common currency leads to more investment across borders.[8] One possible explanation might be that uncertainty, in the presence of entry and exit costs, implies that firms are hesitant to invest in new markets. If future profits are not certain because their domestic currency value is variable, a firm is unlikely to undertake a costly investment decision. Only rather large profit opportunities would induce even a risk neutral firm to invest in new markets. Thus, those costs would create a band of inaction (or hysteresis) around given exchange rates. This also implies that market structure changes due to exchange rate changes are persistent.[9]

The sign of these microeconomic effects on the real interest rate should be positive. Capital should be more productive if it is possible to reap more gains from trade, and enlarged investment opportunities should also drive up the interest rate. It is clear, however, that those possible effects are probably only realized in the medium to long term and not with the start of EMU.

EMU and Unemployment

The positive effects on firms' output and profits should also have an influence on the level of (un)employment in the member countries of EMU. Indeed, Gros has recently established a direct relation between exchange rate variability and unemployment. In a simple econometric exercise he showed that whenever exchange rate variability in the EMS increased it had a negative impact on the rate of employment in Germany.[10] In contrast, he was not able to derive a significant effect of interest rates or the level of exchange rates on employment. Thus, he

[3] P. B. Kenen: Sorting Out Some EMU Issues, lecture delivered at the European University Institute, Florence, 28 March 1996.

[4] Cf. European Commission: One Market, One Money, in: European Economy, Vol. 44 (1990); and D. Gros and N. Thygesen: European Monetary Integration, London: Longman (1992), respectively.

[5] R. Baldwin: On the Microeconomics of the European Monetary Union, in: European Economy Special edition 1 (1991), pp. 21-35.

[6] Most empirical studies fail to support this view because they look at rather short time-periods for which hedging opportunities are available. When looking at longer time periods (beyond one year), a negative effect of variability on trade has been found (P. De Grauwe and B. de Bellefroid: Long-Run Exchange Rate Variability and International Trade, in: S. Arndt and D. Richardson, (eds) : Real Financial Linkages Among Open Economies, Cambridge: MIT-Press (1989), pp. 193-212). For a brief survey of the literature, cf. C. Hefeker: The Political Choice and Collapse of Fixed Exchange Rates, in: Journal of Institutional and Theoretical Economics, Vol. 152 (1996), pp. 360-379.

[7] C. Betts and M. B. Devereux: The Exchange Rate in a Model of Pricing-to-Market, in: European Economic Review, Vol. 40 (1996), pp. 1007-1021; and P. Krugman: Exchange Rate Instability, Cambridge: MIT-Press, 1989. M. Knetter: International Comparisons of Pricing-to-Market Behavior, in: American Economic Review, Vol. 83 (1993), pp. 473-486, reports estimates of the proportion of industries that are subject to "local currency price stability". His highest estimate is for Germany, where 89 per cent of industry are subject to pricing to market.

[8] European Commission, op. cit.

[9] Cf. A. Dixit: Hysteresis, Imports Penetration, and Exchange Rate Pass-Through, in: Quarterly Journal of Economics, Vol. 104 (1989), pp. 205-227; and R. Baldwin and P. Krugman: Persistent Trade Effects of Large Exchange Rate Shocks, in: Quarterly Journal of Economics, Vol. 104 (1989), pp. 633-654.

[10] D. Gros: Germany's Stake in Exchange Rate Stability, in: INTERECONOMICS, Vol. 31 (1996), pp. 236-240. See also the comment by A. Jung: Is There a Causal Relationship between Exchange Rate Volatility and Unemployment?, in: INTERECONOMICS, Vol.31 (1996), pp. 281-282, who rejects Gros' results by using a more sophisticated econometric method. Note, however, that Gros' results are theoretically consistent with the evidence on exchange rate hysteresis.

concludes that it is indeed the variability and not the level of exchange rates that matters. And, in accordance with the above argument about the microeconomic implications of exchange rate variability, Gros finds that investment growth is also negatively correlated with exchange rate variability in Germany. Given high hiring and firing costs in European countries, the hysteresis in trading patterns and investment directly translates into persistent labour market effects. Every reduction in the level of employment that is due to exchange rate variability leads to a persistent increase in the rate of unemployment.[11]

Thus, if monetary union leads to less unemployment because of reduced exchange rate variability, this should lower the expected real interest rate under EMU. Less unemployment puts less pressure on fiscal authorities and the social security system which would reduce the drain on the capital market.

EMU and Public Finances

One of the most debated issues is the fiscal adjustment that member states need to make in order to qualify for EMU. Deficits near three per cent of GDP and public debts near 60 per cent (or levels moving sufficiently fast towards those targets) require severe fiscal contractions in most of the countries aiming to enter EMU in 1999. Those target levels for public finances are widely disputed because in the current situation, with increasing rates of unemployment in most European countries, they are perceived to have an adverse effect on employment as particularly public sector employment is reduced where possible.

The longer run effect on this adjustment of public finances on real interest rates is, however, generally expected to be negative as public demands on the capital markets are reduced. This being the case, markets should expect that the burden of public demands on the capital markets are reduced for those countries making their way into EMU. Because of the requirements for entry, it seems obvious that public finances can only move one way: towards consolidation. Thus, expected long-term interest rates for those in EMU should fall.

Influences on Nominal Interest Rates

While the euro is expected to acquire some of the importance of the deutsche mark and the French franc as an international reserve currency, the demand for the newly created money may actually even drop, as Kenen has argued.[12] This is simply because intra-European foreign exchange reserves are no longer necessary. They will be converted into euro and no longer be usable for intervention. Through this effect the share of euro in international reserves is likely to drop.

However, one might expect that the euro will increasingly be held by third countries, as US dollars or gold are held now for intervention or reserve purposes.[13] The EMI, for example, reports that some third countries have already expressed an interest in changing from dollar to euro reserves.[14] Other sources as well report that the demand for euro as a currency reserve will probably be larger than that for, e.g., the deutsche mark, but will not challenge the dollar's position.[15] Whether this adjustment in demand for euro reserves will be gradual (as Kenen suggest) or fast is open.[16] In any case, the increased demand for euro-denominated bonds should lower the interest rate level in Europe.

The Euro as a Vehicle and Invoice Currency

Most of the literature on the possible external effects of EMU has tried to assess the chances that the euro will become internationally more important, perhaps even rivaling the US dollar as a major vehicle currency.[17] Available evidence is, of course, only retrospective but shows that major shifts in the use of

[11] Cf. L. Ball: Disinflation and the NAIRU, NBER Working Paper 5520 (1996).

[12] P. B. Kenen: Economic and Monetary Union in Europe. Moving Beyond Mastricht, Cambridge: Cambridge University Press, 1995.

[13] Many sources expect that the demand for dollar reserves by EMU members will drop dramatically. This is because external trade of the euro currency area as a share of GDP will fall and thus reduce the demand for currency reserves. Dependent on how large the member group will be, estimates of the excess stock of dollar reserves range between 30 and 70 billion dollars (The Economist, 19 October 1996).

[14] European Monetary Institute: Transfer by the NCBs of Foreign Reserve Assets to the ECB, October 1995.

[15] Cf. the statement by the Commerzbank: The Euro – Serious Competition for the Dollar?, in: Financial Times, 20 September 1996.

[16] The latter position is taken by G. Alogoskoufis and R. Portes: International Costs and Benefits from EMU, in: European Economy Special edition 1 (1991), pp. 231-245.

[17] Cf. ibid., and P. Hartmann: The Future of the Euro as an International Currency, paper presented to the CEPS working party "The Passage to the Euro", Brussels, 24 June 1996. A vehicle currency is a currency that is used by governments and residents of other countries. It is officially used for intervention in the exchange market and as currency reserve. Private use is often made in commodity markets and exchange markets to save time and effort by quoting values in one common denominator. This can also save costs, as transaction costs fall in highly liquid markets.

vehicle currencies are very slow. Since money has important network externalities, currencies once chosen as vehicle currencies have a strong tendency to keep this role.[19] For example, the British pound sterling remained a major currency even after the British lost their dominant role in world markets after World War II and is still important for some former British colonies. In contrast, the deutsche mark has only very gradually gained "market share" vis-à-vis the dollar. Only in Eastern Europe does the deutsche mark play a significant role as an external currency.

Thus, the external importance of the euro will probably take some time to increase given path-dependency in the choice of international currencies. For those countries already using European currencies as a denominator, however, this effect could materialize rather quickly, i.e. on the very day in which the former currencies are changed into euro. That should be important for many Eastern and Central European countries which currently use the deutsche mark, and former colonies of EU members, such as members of the CFA-franc zone in Africa.[20]

Those effects suggest that while the demand for euro will possibly increase, the effect will not be too strong, at least initially. Demand will also be a positive function of the stability of the new currency. Monetary stability should also be important for the decision to use the euro as an invoice currency. Even more important for this latter effect is, of course, the share of the EU's trade with third countries. Since the EMU area will be a major partner in world trade, its currency will naturally be used as a currency of invoice in EU related trade; however, with the possible exclusion of trade with the dollar area. In both uses, as a vehicle and as an invoice currency, we would rather expect a positive effect on interest rates as the demand for the euro increases.

Portfolio Adjustments

One of the expected effects from monetary union for the countries in the EU is that they are no longer exposed to exchange rate risk vis-à-vis their European trading partners. This may or may not have real effects on investment, profits and employment, but it certainly saves transaction costs and hedging costs. As long as hedging opportunities exist, real decisions should not be affected by exchange rate uncertainty. If complete hedging markets do not exist, however, firms may look for other ways to insure against fluctuating currency values.

One possible way to insure against fluctuating currencies is to exploit the covariance structure of several currencies. For example, if a company has business interests in several countries whose currencies usually move in opposite directions, it can exploit this fact since its overall exposure to both currency risks is diminished. An example is the case of the US-dollar and the deutsche mark. These two currencies often move in opposite directions, whereas other currencies tend to be weak vis-à-vis the deutsche mark when the dollar is weak as well. For those currencies dollar and deutsche mark movements may cancel out. If the same effect is true for intra-European movements in exchange rates, the elimination of this possibility to hedge by holding several currencies may induce international firms to acquire currencies outside EMU.[21] This would potentially drive up interest rates in Europe as funds flow out.

Apart from this effect, the importance of the EMU area for portfolio and direct investments is contingent on its performance in terms of monetary stability. The attractiveness of investments in the currency area depends on the real developments of the market and thus picks up the real effects from monetary union that we have discussed above.

Influences on the Risk Premium

Risk premiums in general compensate for various uncertainties. In the case of EMU, uncertainty surrounding conversion rates from national currencies into euro is of particular importance. We see three sources of uncertainty:

☐ Several authors have suggested that countries might have an incentive to manipulate their exchange rate vis-à-vis the euro shortly before conversion.[22] This "surprise" devaluation would be undertaken to gain price competitiveness in the common market.

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[18] P. Krugman: Vehicle Currencies and the Structure of International Exchange, in: Journal of Money, Credit and Banking, Vol. 12 (1980), pp. 503-526.

[19] P. B. Kenen: Economic and Monetary Union in Europe, op. cit. notices that the reduction in the number of currencies with EMU might have a profound effect on the vehicle role of the dollar because the necessity of a vehicle currency is a positive function of the number of currencies existing.

[20] P. B. Kenen: Economic and Monetary Union in Europe, op. cit.

[21] B. Eichengreen: Should the Maastricht Treaty be Saved?, in: Princeton Studies in International Finance, Vol. 74 (1992).

[22] Cf. e.g. M. Fratianni, J. von Hagen and C. Waller: The Maastricht Way to EMU, in: Princeton Essays in International Finance, Vol. 187 (1992).

☐ As a practical matter, there may also be a rounding of exchange rates to facilitate conversion. This may be important to increase the willingness of consumers and producers to undertake the necessary changes of price tags.

☐ There is a legal uncertainty concerning the convertibility of debt contracts from a national currency into euro.

All three effects will result in a positive risk premium for German bonds. Kenen, however, convincingly shows that some of these fears contradict clear requirements of the Maastricht Treaty.[23] The treaty states that the locking of exchange rates must not alter the external value of the ECU and rules out any changes in the weight of the currencies in the ECU basket. In addition, the Madrid summit decided that the euro and the ECU must be exchangeable on a one-for-one basis at the start of EMU. Kenen then argues that there is only one way to simultaneously fulfil the requirements of the Treaty and the Madrid summit: if the locking of exchange rates on 1. January 1999 takes place at the prevailing market levels. This would of course imply that countries cannot decide on the conversion rate, but they might nevertheless try to manipulate their entry level.

Expected Inflation

Most of the empirical approaches that study the forward interest rates as a predictor for EMU focus on the expected increase of inflation for Germany and reduced inflation for certain other countries. Thus, the more likely markets perceive EMU to be, the higher the premium on long-term German bonds should be. For this to be true, of course, the hypothesis must hold that average inflation will indeed increase in Germany. Zettelmeyer in his study fails to find such an effect.[24] In particular, he does not find that German bonds and those of less stable currencies move in the opposite direction. This would suggest that markets do not expect average inflation in EMU to increase. One explanation could be that the European Central Bank is expected to follow an even more restrictive monetary policy than the Bundesbank, simply to prove those wrong who expect it to be less stability oriented.[25]

Indeed, according to a recent poll German enterprises do not expect inflation under EMU to increase. When asked what they fear as a negative implication of EMU, they did not mention higher inflation.[26]

But even if those inflationary expectations did exist, it could be that other effects are stronger than the inflationary mark-up on long-term bonds. As argued above, the expected real effects from EMU might more than compensate for fears of inflation. The fact that those real effects may also vary for different European economies could imply that they compensate different inflation expectations for different currencies in Europe so that the overall effect is not clear.[27]

Discussion

We summarize the various effects as follows

$$L_i = R_i \left[\underbrace{I_i\,(TA,\ Eff)}_{+},\ \underbrace{G_i\,(Maastricht,\ UE_i\,(I_i))}_{-} \right] \tag{5}$$

$$+ (M^D_{Euro} - M^S_{Euro}) \left\{ CR \left[Var(e) \left(\underbrace{\frac{T_{EU}}{T_{World}}}_{+} \right) \right] \right.$$

$$\left. + (Veh + Inv) \left[\underbrace{\left(\frac{T_{EU}}{T_{World}} \right)}_{+},\ \underbrace{\pi_{EURO}}_{-} \right] + PF \left[\underbrace{CrossHedging}_{-},\ \underbrace{\sum I_i}_{+} \right] \right\}$$

$$+ C_i \left[\underbrace{Conv}_{+},\ \underbrace{\pi^E_{EURO}}_{+} \right]$$

where all variables express changes vis-à-vis the current pre-EMU level of the respective variable in comparison to the national currencies or, respectively, to the euro. We expect the long-term interest rate for a particular currency to be a composition of country specific effects and of common effects due to EMU. The real effects I are country specific and comprise efficiency gains (Eff) and the reduction in transaction

[23] P. B. Kenen: Sorting Out Some EMU Issues, op. cit.

[24] J. Zettelmeyer: EMU and Long Interest Rates in Germany, in: Paul J. J. Welfens (ed.): European Monetary Union: Transition, International Impacts and Policy Options, Berlin: Springer-Verlag 1997.

[25] In fact, at least according to its statutes, the ECB should be more inflation averse than the Bundesbank. Its only mission is to provide monetary stability (while the Bundesbank is also responsible for general economic developments), and it is nominally even more independent than the Bundesbank.

[26] Cf. A. Juchems, G. Nerb and D. Radowski: Vorbereitungsmassnahmen der Unternehmen auf die Europäische Währungsunion, in: Ifo-Schnelldienst 15 (1996), pp. 3-9.

costs (TA), the reduction of the government's fiscal burden due to the Maastricht fiscal criteria (Maastricht) and the reduction in unemployment due to increased investment (UE). As the importance of these effects is likely to differ from country to country, this effect is indexed.

Secondly we expect nominal influences from changes in the money demand (relatively to money supply) affecting all countries similarly once the euro operates. There is the demand for currency reserves (CR), which is a function of the variability of the exchange rate (e) with third countries. Also, we have the demand for vehicle currencies (veh), which is again a function of the union's share in world trade and the inflation rate of the euro π. The same influence is expected for the demand of the euro as an invoicing currency (inv). Moreover, there might be adjustments in the portfolio composition of currency demands (PF) that is dependent on cross hedging effects (i.e. the covariance of the euro to other currencies) and the sum of efficiency gains in the member countries.

Finally, there is a pure risk premium that reflects the effects of increased (lowered) inflation and the insecurity of bond holders concerning the rate of conversion from national currency into euro. As the sign of the inflation change is country specific, this risk premium is again country specific. It is only this single effect that most of the literature has focused on. Apparently, its influence is mitigated by all the other effects we have listed in the foregoing discussion.

The various effects cannot provide one single and clear answer concerning the effects EMU might have on interest rates in the monetary union. We have identified positive effects and negative effects whose relative strength cannot be determined unambiguously. Moreover, they are all derived under the assumption that the money supply is stable. While it is obvious that the ECB will do its best to stabilize the effects from shifts in money demand, this is not a trivial task, as our discussion shows. It might be relatively easy to account for shifts in stocks, but it is a much harder task to control for shifts in flows. Given these controllability problems for the ECB, the likely results of monetary policy in EMU are hard to predict. This might ultimately also be one reason for the perceived risk premium on long-term bonds in European currencies.

Empirical Evidence

Ideally, an empirical investigation should attempt to identify the various channels outlined in the theoretical discussion. The problem with such an approach is that it requires the identification of expectations about the future development of at least three distinct variables, namely real rates, nominal rates, and the risk premium. While some empirical methods have been proposed to deal with this problem, none are particularly helpful in this context.

Studies that decompose interest rates into real and nominal components drawing on historical data and under the assumption of rational expectations, are able to recover inflationary expectations.[28] While such an approach can be helpful in providing a historical analysis, it is not suitable for giving an assessment of interest rate developments ahead.[29]

An alternative approach is to rely on survey data about expectations. However, survey data has considerable weaknesses as well. First, the ability of surveys to measure expectations adequately is questionable, since participants have little incentive to forecast correctly. Second, and more fundamentally, survey data is available for relatively short time horizons only, but not for the time frame under consideration. Given these problems with the estimation of an equation such as (4) or (5), we instead propose a simpler empirical approach, which tests a feature underlying the debate about the effects of EMU on interest rates, namely whether the behaviour of interest rates has changed with the possibility of monetary union. The test is based on the idea that there are two kinds of bonds currently outstanding: those maturing before EMU and those maturing after. Differences in the time series behaviour of the two groups of bonds should provide information about the possibility that EMU affects bond yields.

Structural Shifts in the Rate Process

Since the magnitude and direction of the various theoretical effects outlined above cannot be

[27] Different real effects may be due to different degrees of openness (the importance of EMU thus varies), different situations of public finance (highly indebted countries should see a stronger effect on interest rates when reducing public debt), and different organizations of the labour market (which would imply different influences of EMU on labour markets).

[28] Cf. e.g. S. Gerlach: The Information Content of the Term Structure: Evidence for Germany, CEPR Discussion Paper 1264 (1995).

[29] An additional problem with this particular approach is that it requires that real rates are constant over time. As we discussed above, this assumption is questionable in the context of EMU.

determined empirically, we turn to a simpler and more fundamental test here. We seek to determine whether the time series behaviour of interest rates has changed in anticipation of EMU. In particular, coefficients of a model describing the determination of interest rates should change once the EMU effect, which is omitted from the model, becomes important. We consider two groups of bonds, those maturing before 1999, the planned starting date of EMU, and those maturing after 1999. Only bonds maturing after 1999 should show an EMU effect.

The time span of our investigation is July 1990 to September 1996. The starting date is chosen to coincide with the beginning of German monetary and economic union, while the end date is dictated by data availability. We employ an F-test for structural change (see box) to test for the equality of coefficients before and after November 1993, the date the Maastricht treaty was ratified. Rejection of the null hypothesis of no structural change of the coefficients in the equation for the long bond is interpreted as consistent with the idea that EMU has changed interest rate behaviour in Germany. For EMU to be a credible explanation for the break, only bonds maturing after 1999 should display it. On the other hand, bonds maturing before 1999 should not show a break.

A Test for Structural Change

The unrestricted model is

$y_1 = x'_t\beta_1 + \varepsilon_t \qquad t = 1,...,T_1$

$y_1 = x'_t\beta_2 + \varepsilon_t \qquad t = T_1 + 1,...,T_1 + T_2$

and H_0: $\beta_1 = \beta_2$.

The test for a structural change of coefficients is given as

$$\frac{(SSE_C - SSE_U) / k}{SSE_U / (T - 2k)}$$

where

SSE_U = sum of squared errors of the unconstrained model.

SSE_C = sum of squared errors of the constrained model.

k = number of explanatory variables.

$T = T_1 + T_2$ = sample size.

Under the H_0 of no structural change, the statistic has a distribution of F(k, T-2k).

Table 1

Marginal Significance Levels of F-tests for Equality of Coefficients in the Periods July 90 – Oct. 93 and Nov. 93 – Sept. 96

Maturity of long bond	Equation 6	Equation 7
10-year	0.088	0.445
8-year	0.104	0.439
6-year	0.127	0.429
4-year	0.176	0.412
2-year	0.316	0.400

Note: Marginal significance levels of an F-test of the H_0: The coefficients are equal in the two periods.

We employ two models. First, a specification which relates changes in the bond rate to changes in the money market rate. Second, a more complex model, where the bond rate depends on own lags, the money market interest rate, and the state of the economy as measured by the annualized growth of industrial production and the price level.

$$\Delta Bond_t = a_0 + a_1 \Delta\ Moneymarket_t + \varepsilon_t \qquad (6)$$

$$Bond_t = b_0 + b_1 Bond_{t-1} + b_2 Moneymarket_t + b_3 Inflation_t + b_4 IP - Growth_t + \varepsilon_t \qquad (7)$$

As can be seen from Table 1, the equivalence of coefficients can never be rejected at the 5 per cent level of significance and only once, using Equation(7) for the 10-year bond, at the 10 per cent level. Since our empirical methodology is unable to detect any evidence for a structural break in the time series behaviour between the sample before and after the ratification of the Maastricht treaty, there is no base for the claim that long German bonds are suffering from a risk premium caused by EMU.[30]

Conclusions

The two main conclusions of this paper are as follows. First, EMU can cause several real and nominal effects which overlap and have an uncertain effect on long rates. The emphasis on an inflation premium in explaining long-term interest rates in Germany is therefore misguided. Second, an analysis of the time series behaviour of German interest rates since unification does not reveal a structural break. This is further evidence against the existence of a premium caused by EMU.

[30] The issue remains that we are unable to sort out the various theoretical channels. It is therefore true that we cannot rule out, for example, that a positive inflation premium is offset by lower expected real interest rates. However, as discussed above, such a scenario must remain mere speculation.